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ABSTRACT

A naturalistic study of the use of computers in a preschool program suggested that a role for the computer in early childhood education exists, but it may not be the role that critics and advocates have envisioned. Phase 1 of the study investigated young children's interactions with computer software, peers working at computers, and teachers. Subjects were six preschool children whose interactions were videotaped during five 1-hour sessions during which they chose software and duration of computer involvement. Findings indicated that children differed in types of software they enjoyed, ways they interacted with the computer, amount of teacher help they required, and discussions with peers. Enjoyment and teacher support were key factors in children's continued computer use. When, in Phase 2, a computer learning center was introduced into a preschool classroom containing 25 children and 7 other indoor activity centers, videotaped observations of children's use of a drawing pad program indicated that the computer center can provide another rich environment for preschool programs, and may be especially valuable for some children. The preschool computer activity center may function best as a social center, a place for choice, for curiosity, for trying things out, and for fostering a problem solving attitude. (RH)

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Is There a Role for Computers in Early Childhood Programs: A Naturalistic Study

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Is There a Role for Computers in Early Childhood Programs: A Naturalistic Study

This research was motivated by the question of whether young children should be exposed to computers and if so, what is the "right" kind of computer involvement for young children? As teacher-educators involved with a university-sponsored preschool and child development laboratory, our concerns were many: 1) the content of much of the available software and its compatibility with the active learning approach that was central to our preschool program objectives and early childhood philosophy; 2) the fear expressed by many that time spent at the computer would deprive children of needed physical activity and involvement with real objects and children.

In preparation for the introduction of the computer into our preschool, we moved cautiously through two phases of research and implementation, using naturalistic observation in two different settings.

Specific research questions we hoped to answer in our naturalistic research included the following:

1. How will young children react to various types of software, specifically, how will non readers cope with written instructions?
2. How much help will learners need from teachers?
3. How will children share the computers? and software?

4. How will computers affect peer interactions?
5. What will staff reactions be to children's use of the computer, and what preparation needs to be made for them to be comfortable in this new role?
6. How will the introduction of the computer into the preschool setting affect children's interaction and play choices?

The use of computers in preschool programs is an issue which has many teachers and directors concerned. Questions arise about the traditional academic nature of much of the available computer software and the advisability of immersing preschoolers in this type of learning, e.g., alphabetization, letter and number recognition, counting and simple arithmetic computation. In addition, it has been suggested that children need experience with real events and objects and that computers may limit these involvements and the child's physical activity (Barnes & Hill, 1983). Conversely, there is evidence that the computer can help children with fine motor coordination, language development, memory patterns, and serve as an aid in thinking and problem solving (Karoff, 1983; Bowman, 1983). In addition, there is some evidence of socialization and interaction as children share their discoveries and give help to others (Ziajka, 1983).

Upon reviewing the present state of research on the use of computers with young children, numerous authors offer advice on

the appropriate use of computers with young children. Most concur that the computer has a place in the preschool environment, but that computers should fit within the goals of preschool education, program goals driving the use of computers rather than the other way around. Clements (1985) and Weikart (Berreuta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984) provide principles and procedures for judging the usefulness of computers in early education. Clements provides a series of general principles, often cited as guidelines for educational practice in early education, which can be used to assess computer practices.

1. Provide opportunities for interaction, development of positive self image, and learning without pressure for mastery.
2. Provide opportunities for active participation in planning and executing activities, and to express themselves freely and creatively.
3. Encourage children to become independent learners by providing opportunities to explore, discover relationships, investigate alternative solutions to problems, set goals, predict events, and learn rules rather than unrelated facts.
4. Provide opportunities for investigation of real world problems with concrete materials which provide feedback as a natural consequence. The curriculum should be

intrinsically motivating and grow out of childrens' interests, with play as a central method for learning.

Weikart's work on the Perry Preschool study provides guidelines for a successful preschool curriculum. The core of this curriculum is a plan the child makes each day, based on available choices. These plans call for the child to actively explore and discover relationships and to carry out and evaluate their progress at the end of each work period. This cycle is consistent with many of Clements' principles listed above; it promotes initiative, responsibility, problem solving, social cooperation, and a variety of psychomotor and intellectual skills. The question becomes: Can computers provide children with experiences compatible with a child-initiated approach to learning?

A central issue in the introduction of computers into an early childhood program is an evaluation of computer software to ensure its compatibility with program objectives. However, even after software evaluation and curriculum articulation, additional questions need to be answered, including: How should computers be shared among students? Can students work independently on software which often includes written menus and directions? How will teachers and program planners know the effects computers are having on children? Finally, a critical concern is: How to develop teacher skills and attitudes which are conducive to the use of computers in the classroom? Without these teacher skills

and attitudes programs have little chance of success regardless of the creative potential of the computer software utilized (Killian, 1985).

The first phase of this study was a naturalistic investigation of young children's interactions with computer software, other children working on computers in their group, and teachers. The subjects were six pre-school children whose ages ranged from three to five. The children were all volunteers with varying degrees of experience on computers ranging from none to substantial. Children's interactions were videotaped during five one hour sessions. While interacting on the computers, the children were assisted by a familiar teacher. A wide range of software was available for students to use, from graphically attractive drill and practice and reading readiness programs to more open LOGO (Papert, 1980) based programs for pre-schoolers. Children were allowed to choose their own software and whether or not they chose to stay in the computer environment. Three observers recorded data about length of time children were involved and types of interactions, as well as anecdotal information about the character of the interactions.

While age differences were expected, we were surprised by the different styles of interaction each child utilized. Children not only differed in the types of software they enjoyed, but also in the way they interacted with the computer, the amount of teacher help they required, and their discussions with peers. While some

children were drawn into using software through the enthusiastic direction of a peer, others were sometimes overwhelmed by a peer's advanced use of a specific program. An important variable was the child's enjoyment of the software program and ability to learn from it. For example, children seemed to lose interest in drill and practice activities, either after mastery of the concept or after they became sufficiently frustrated at being unable to master the step by step progression of the lessons. Student enjoyment was essential to continue software utilization and active exploration of the computer program in the future. An idea helpful to both students and staff is to consider the available computer software as a series of self initiated learning centers each with a child related goal.

Other outcomes of interest were that children were more actively involved socially than we had anticipated, interacting not only with the machine, but with teachers and peers. In addition, teacher interaction that supported the child's investigation seemed to be all important. Statements such as "This is too hard. Would you like to try another?" had the effect of stopping the child's involvement. This could be seen most notably when the teacher did not support the goal of the computer software. For example, the statement above was made during the first phase of this study about a drill and practice reading readiness program dealing with skills the teacher perceived to be

unsuitable for pre-schoolers. However, this same teacher was supportive of the child's investigation of a LOGO based program. Childrens' involvement with LOGO often lead to long term interaction with a computer as the child moved the cursor (shaped like a triangle and called a "turtle") around the computer screen, leaving "tracks" or lines behind it, forming abstract or realistic graphic representations (e.g., houses, rockets, the sun). Through this experience students have the opportunity to investigate cause and effect, get immediate visual feedback on the commands made, and make corrections. Generally, children worked at their own pace and level of understanding, explored the cause and effect pattern of making something happen and the ability to reproduce these results consistently.

Our conclusions from the first phase allowed us to set up a computer learning center in the Child Development Laboratory in which the second phase of our observations and videotaping took place.

When we introduced the computer into the preschool classroom it was one learning center among seven other indoor activity choices. The room was spacious; there were 25 children varying in age from 3 1/5 to 5, with three teachers and additional student aides. Using a curriculum model similar to Weikart's, children selected to work with the computer.

The software we first chose was a drawing pad, Micro Illustrator by Chalk Board, enabling children to draw on a large pad with a stylus. The menu in the program included choices of background color, drawing color, fill in color and design. Procedures included the concepts of pen down, lock, erase, draw. These procedures could be carried out without the keyboard. With the keyboard children were able to save their drawings and retrieve them later on the screen.

As in the first phase of our study, videotaped observations provided rich and detailed information of what children and teachers did in the computer center. Over time, many of the initial concerns that we had could be put aside, and many of our questions were answered.

The teacher's ability to offer encouraging comments that enabled the child to discover the procedures promoted the child's later autonomous use of the computer. For example, questions such as "How did you get it to do that?" enabled the child to rethink the important steps she had taken to get the results that she did. In this way children could repeat satisfying results using the rules that they have discovered.

Over time, we noted that children taught one another, took turns in increasingly self-regulated ways, encouraged and cheered others, sang spontaneously, and delighted over what they were able to make happen. We heard teachers' comments that helped children

to gain a sense of their own competence "Look at the wide lines you made. That took a lot of arm movement!" We heard teacher reminders of the sequence of steps and affirming feedback: "There, you got it. That's the way! There you go!" --- supportive comments that enabled children to make decisions, to be in control of the activity, and to discover cause and effect relationships.

Over time, too, we observed that children's attention span for computer activity tended to increase, to an average of 11 minutes, with a range from less than a minute to 45 minutes. We continued to see individual differences in persistence, intensity, in the ability to watch, in the need to be physically involved, in level of frustration, in the choice of whether to come to the computer or not.

It is important to consider a few general guidelines for staff development (Killian, 1985). First, those in leadership roles should be knowledgeable about computers and competent in its operation. One can hardly lead staff in software evaluation and curriculum integration without knowledge of computers and software. In addition, there is little chance for computers to become a meaningful part of the curriculum if staff are not given comprehensive, long term inservice education. The type of computer literacy needed to make computers a valuable part of an educational program goes beyond programs which focus on one programming language, or

piece of software. Inservice should center around practices which translate into efficient, effective classroom practice. Finally, support needs to go beyond formal inservice programs if computers are to become an active learning station for children. Consistent support must be given to teachers. This support should take many forms, including ample hardware and software, release time and access to resource personnel available, and the loaning of hardware and software to faculty overnight, on weekends, and over vacation periods.

Our conclusion is that the computer is remarkably like other engaging objects in the preschool environment. A key seems to be the child's initiation of the activity, whether it involves the computer or not. Hence, children would decide to initiate a computer activity based in part on the other choices available to them, often choosing other appealing activities such as plays, field trips, other learning centers, or outside play. The computer did not appear to be either the menace some would make it out to be or the utopian teaching tool others hoped for. However, properly integrated, it can serve as another rich environment for preschool programs, and may be especially valuable for some individual children.

From our observations in the natural setting of the preschool, we see the computer as a social center, a place for choice, for curiosity, for trying things out, and for fostering a

problem solving attitude. We conclude that, yes, there is a role for the computer in early childhood, but it may not be the kind of role that either critics or some advocates have envisioned.

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